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ABSTRACT

The objective of the study was to predict potential procrastinators in a self-pacing instructional system. Seventy-five entering college freshmen were randomly selected to participate in a large scale individually-paced program. Those students (25) who procrastinated were classified as "no-start-procrastinators" (NSP); the remainder (52) were classified as "satisfactory progressists" (SP). This binary variable (NSP vs. SP) was regressed via step-wise multiple regression on the following predictors: ACT scales, Nelson-Denny scales, SSHA scales, Cooperative Algebra Test, Cooperative Trigonometry Test, high school percentile rank and "under-over" achievement. The multiple regression yielded a multiple correlation of .58. (Author)

Prediction of Procrastination in a Self-Pacing Instructional System

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RESEARCH PROBLEM

Procrastination would seem to be the nemesis of self-pacing instructional systems. This fact was clearly brought to light in an address given at the Keller Method Workshop held at Rice University (Leidecker, 1972). Practically the entire content of this speech was devoted to the problem of procrastination.

The objective of the present study was to discover predictors that will identify potential procrastinators before they enter a self-pacing system. The study centered around a special breed of procrastinator who was called the "no-start-procrastinator" (NSP). The NSP is the student who cannot seem to get started working on the instructional objectives. By the third or fourth week the NSP's are far behind the rest of the students, and usually they do not show up to see an instructor until notified by their dean or advisor. Possibly, these students are capable of doing the work, and they, for the most part, have been "lazy" and unable to pace themselves. Reviews of the literature and observation of the NSP's generated the following hypothesis: There will be a statistically significant relationship between the independent variables--aptitude, prior academic performance and personality variables and the dichotomous dependent variable--"no-start-procrastination population" vs. "normal population." Also, this significant relationship will generate a linear combination of predictions to the dichotomous dependent variable.

The Instructional System

The self-pacing courses involved in the present study were part of the Oklahoma State PIPI (Preprofessional Individually Paced Instruction) project. The PIPI project featured a forty-hour curriculum of math, chemistry, physics, English, speech and computer science. These courses were taught in the Mastery Learning Individually-Paced Mode (ML-IPI). All of population in this study were enrolled in the PIPI instructional system.

Population

The population was formed by using a table of random numbers to select students from a pool of eligible students that formed each day throughout the 1971 summer freshman orientation program. To be eligible for selection to the population, a student must have declared a desire to be either a mathematics, physics, chemistry or engineering major. This declaration was made during the morning of the student's first day of the orientation. If the student was randomly selected for the group the second morning of orientation, his advisor informed him that he was eligible for the ML-IPI instructional system's courses. The advisor explained the nature of the courses to the student, and while doing so, tried to avoid giving the student the impression that he was to be an experimental subject. If the student decided that he did not want to enroll in these courses, he was allowed to enroll in the conventional courses. There were three students who decided to go into the conventional system. At the end of the summer orientation program, there were 110 group one students randomly selected and pre-enrolled in the ML-IPI instructional system. All of these students were enrolled in at least two courses within this instructional system, and some were enrolled in as many as four.

Seventy-seven of the 110 randomly selected group one students actually enrolled at the university for the fall semester. These 77 students comprised the population for the study.

By the end of February 1972, all active students had completed their ML-IPI system courses.

Dependent (Criterion) Variable

The dependent variable is a binary variable that has two classifications: 1. No-Start Procrastination (NSP) and 2. Satisfactory Progression (SP). Any subject that had a grade of D or F at midterm was classified as a NSP and given a score of 0.0. All the subjects with a grade of C or better were classified as a SP and were given a score of 1.0. The criterion for being awarded an F at midterm was that a subject had done nothing in the course by midway through the semester. The criterion for a D was that the subject had done some work but had lagged far behind the rest of the students. These D subjects, for the most part, had done nothing until just before midterm; then, in an effort to avoid an F, they accomplished just a few units of instructions. Almost without exception, if a subject was procrastinating in one of his ML-IPI courses, he was procrastinating in all of them.

Of the total population, 25 were identified as NSP's and 52 were classifed as SP's.

Predictors

The aptitude variables used as predictors were as follows: Engish ACT, math ACT, social science ACT, natural science ACT, composite ACT, Nelson-Denny - verbal, Nelson-Denny - comprehension, Nelson-Denney - rate, Nelson-Denny - total, Cooperative Algebra and Cooperative Trigonometry.

The prior academic performance variable was high school percentile rank (rank/class size). This variable was used as a parametric statistic for the purpose of this study.

The personality variables consist of the Brown-Holtzman Survey of Study Habits and Attitudes (SSHA) scales which are the study habits scale, the study attitudes scale and the study orientation scale; also included in the personality variables are the ACT discrepancy score (ADS) and the class percentile rank discrepancy score (CDS). The SSHA was administered to the subjects by testing professionals of the University Tests and Measurements Bureau during the summer orientation, summer of 1971.

The ADS was formed by first computing a multiple regression of Composite ACT on the following predictors: mathematics ACT scale, English ACT scale, natural sciences ACT scale, social sciences ACT scale, the SH, SA and SO scales from the SSHA, the vocabulary, reading comprehension, reading rate and total score scales from the Nelson-Denny - Reading Test, Cooperative Algebra Test, Cooperative Trigonometry Test and the class percentile rank. The multiple regression procedure generated regression coefficients for each predictor that made a statistically significant (0.05 level) contribution to the regression equation; also a multiple correlation coefficient of 0.815 and a multiple standard error of the estimate of 1.871 were computed. The regression coefficients were used to predict a Composite ACT score for each subject. Next, the subject's actual Composite ACT score was compared to the predicted one. All of those subjects whose actual Composite ACT Score fell one-half a standard error of the estimate below (less than) the predicted Composite ACT was classified as an "underachiever" (UADS). The rest of the subjects, all those not classified as an underachiever, were classified as "satisfactory achievers" (SADS). These classifications of

UADS and SADS formed the basis for the binary predictor variable "ACT discrepancy score"; this binary variable was quantified by assigning a 0.0 to those subjects classified as UADS and a 1.0 to those subjects classified as a SADS.

The procedure for forming the CDS variable was basically the same that was used to form the ADS. First, a multiple regression of class percentile rank on the following predictors was computed: the ACT scales including Composite ACT, the SSHA scales, the Nelson-Denny scales, the Cooperative Trigonometry Test and the Cooperative Algebra Test. The procedure derived a regression coefficient for each predictor making a statistically significant (0.05 level) contribution to the regression equation. A multiple correlation of 0.269 and a multiple standard error of the estimate of 30.701 was computed. The CDS, like the ADS, is a binary prediction variable. All of those subjects whose actual percentile class rank was one-half a standard error of the estimate less than their predicted class percentile rank was classified as an "overachiever" (SCDS) and was assigned a score of 1.0 on the CDS variable. All the rest of the subjects were classified as "normal" (UCDS) and were assigned a score of 0.0 on the CDS variable.

Under and over achievement measured in the manner of ADS and CDS have, in previous research, been used as measures of motivation (Thorndike, 1967; Hummell and Sprinthall, 1965).

Calculations

Computations were accomplished by an IBM 360 using step wise multiple regression program. Any variable contributing to a statistically significant increase (.05 level) of the multiple correlation coefficient was retained in the regression equation. The results of the computations are presented in Table I.

The regression equation is of the form:

$$Y_d = A + b_1X_1 + b_2X_2 + \ldots . b_nX_n$$

Where: Yd = dichotomous dependent variable

A = intercept

b = regression coefficient

X = predictor score

When Yd is equal to .5 or greater the subject is classified as a SP.

When Yd is less than .5 the subject is classified as a NSP.

TABLE I

RESULTS OF STEPWISE MULTIPLE REGRESSION

PREDICTION OF NSP

Predictor	Stat. in Equa.	Reg. Coeff.	Mean	S.D.	Dep. Vari. Corr.
English ACT	incl.	0.68	21.5	3.2	0.13
Math ACT	rej.	-0.04	27.7	3.7	-0.02
Soc. Sci. ACT	rej.	0.01	21.9	5.2	0.11
Nat. Sci. ACT	rej.	-0.01	25.7	4.7	-0.02
Composite ACT	rej.	-0.05	24.4	3.1	-0.09
SH-SSHA	rej.	-0.01	52.6	17.7	-0.09
SA-SSHA	rej.	-0.01	58.8	16.7	-0.13
SO-SSHA	rej.	0.01	110.7	31.7	-0.13
Verbal-ND	rej.	-0.01	39.9	11.4	-0.02
Comprehension-ND	rej.	0.01	47.8	9.9	0.12
Total-ND	rej.	0.00	87.7	19.0	0.05
Rate-ND	rej.	-0.01	315.1	85.6	-0.17
Coop. Algebra	incl.	0.07	33.2	4.0	0.23
Coop. Trig.	rej.	-0.01	13.6	5.6	-0.01
Percentile Rank	rej.	-0.01	21.4	19.7	-0.22
ADS	incl.	0.40	0.6	0.5	0.18
CDS	incl.	0.11	0.7	0.5	0.30

"A" Coefficient = 0.68

Multiple Correlation Coefficient = 0.58

Multiple Standard Error of Estimate = 0.45

Results

The results of the computations revealed a Multiple Correlation of 0.58 which is statistically significant at the 0.05 level. There were four predictors included in the equation. These four variables were English ACT, Cooperative Algebra, ADS and CDS. The hypothesis as stated in the "Research Problem" section of the present study is accepted.

Summary and Conclusions

As mentioned, in self-pacing programs, there are some students who cannot seem to manage their time. This may seem to be a strange trait to find in an individual whose scholastic achievements have gotten him as far as college freshman status. However, most college freshmen are used to (for 12 years) an instructional system that places rather severe constraints on factors involving time to learn. In light of this fact, many students have always responded to deadlines set for them, not by them; thus, these students have not had the opportunity to manage their own academic time schedule. For some students, even at college level, the removal of time constraints does not appear to be a wise educational move because many cannot seem to get started; thus, they fall behind, use up instructional resources, and then drop out. This phenomenon of procrastination as it now manifests itself creates a tremendous drain on the efficiency of an instructional system. Obviously there is an educational need to make early identification of potential procrastinators so that either an alternative for the procrastinator can be built into the system or he can be screened out of the self-pacing type of instructional system. It is a disservice to the NSP student to allow him to enter the self-pacing system (as it now exists) for he may do well or at least survive in a more conventional system (he has for 12 years).

The results of the analysis as presented indicate that a large step forward in satisfying the above stated need has been made. Although the predictive efficiency of the regression equation is only moderate (standard error of estimate = 0.45), predictions can be made at better than chance accuracy and probability parameters can be placed to mispredictions. The superiority of multiple regression is manifested by the fact that the largest single correlation with the dependent variable was 0.30 while multiple correlation was 0.58. Again, a side-benefit beyond the scope of this study but available is the study of individual variable relationships via the correlation coefficients.

It is suggested that the research methodology associated with the study be used to predict procrastinators for the purpose of assignment to special instructional subsystems within the large self-pacing system and/or for the purpose of exclusion of certain students from the system. When using the regression equations, the researcher and instructor can manipulate the direction of misprediction. Depending on the reasons for prediction and the value judgments of the particular managers of instruction, the exact probability of misidentifying a student as a NSP can be computed and manipulated. For instance, if only students with a predicted score of 0.95 or above were classified as a SP and allowed into the instructional system, one could expect that approximately 34% of the predicted NSP's would actually be students who would have progressed satisfactorily (assuming a standard error of the estimate of 0.45). In this situation, only approximately 15% of the students predicted to be suitable for the system would actually be NSP's. Of course, the cut-off scores could be manipulated such that the greater probability would be to mistakenly classify a student as one who would do well in a self-pacing system.

A Follow-Up Study

During the Oklahoma State summer orientation and pre-enrollment, the regression equation (prediction of procrastination) was applied to prospective freshmen eligible for the PIPI project. Sixty-five students were identified as having a high probability of success. Thirty-seven of these students actually enrolled in the PIPI project courses. The least number of the self-pacing courses that any of these 37 were enrolled in was two and the maximum number was four. At the end of the 1972 fall semester, the grades for these 37 students, as well as the other 247 students in the PIPI classes were compiled. The average grade distribution for all other PIPI students (combining all courses) was as follows:

32% = A
8% = B
7% = C
0% = D
7% = F
29% = Incompletes
18% = Withdrawals

The grade distribution for the 37 was as follows:

26% = A
10% = B
12% = C
0% = D
2% = F
32% = Incomplete
7% = Withdrawals

If one considered the above distributions stable, the smaller number of F's and W's in the 37 students could indicate that the equation is predicting procrastination (or lack of).

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PREDICTION OF PROCRASTINATION IN A SELF-PACING INSTRUCTIONAL SYSTEM

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